Lab Manual

BIOCHEMISTRY

WOMEN MEDICAL COLLEGE

A b b o t t a b a d

ABBOTTABAD

Created by:
Dept. Medical Education & Research (DME&R)

PARTMENT OF BIOCHEMISTRY

WOMEN MEDICAL COLLEGE,

ABBOTTABAD.

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Description of the Department

Giving a fair introduction to our undergraduate students is our goal. Students must be familiar with different aspects of the biochemistry. Students are introduced to the full subject by the first two years of MBBS. The subject is integrated into the higher years of MBBS as a basic subject. The lab is designed to meet the learning needs of the undergraduate students. Our goal is to teach undergraduate students the basic concepts of biochemistry.

Details of faculty responsible for course conduction:

TEACHING FACULTY:

S.No	Name	Qualification	Designation

1	Prof Dr Uzma Faryal	MBBS,MPhil,PhD (Biochemistry), CHPE	Head and Prof of Biochemistry
2	Dr Bibi hajira	MSc, MPhil, PhD (Biochemistry)	Associate Professor
3	Dr Shahid ullah Khan	MSc, MPhil, PhD (Biochemistry)	Assistant Professor
4	Dr Javeria Saqib	MSc, MPhil, PhD (scholar)	Senior Demonstrator
5	Dr Rabia Gul	MBBS	Demonstrator
6	Dr Marzia Batool	MBBS	Demonstrator

Details of supporting staff:

NON-TEACHING FACULTY

S.No	Name	Qualification	Designation
1	Mr Shehzad	Matric,FSc	Lab Technician
2	Miss Kiran	MSc Computer sciences	Computer Operator
3	Miss Sonia	Matric	Store keeper
4	Mr Qari Naseer	Matric	Lab attendant

EQUIPMENT OF BIOCHEMISTRY LAB

EQUIPMENT: COLORIMETER

A colorimeter is used to measure the absorbance of light of particular wavelengths in a specific solution. The different solutions absorb light of a different wavelength equal to the concentration of the solution when exposed to light. This is the basis of colorimetric or simply Beer-Lambert's Law.

The colorimeter is used in various fields of science as well as non-science for measuring the concentration of solutions or density of the solution.In the clinical laboratory, a colorimeter is used to analyze urine, plasma, serum, and cerebrospinal fluids for biochemical studies.

EQUIPMENT: MICROSCOPE

It refers to an optical instrument that uses a lens or an arrangement of lenses to magnify an object. Also, they help to view different organisms. Furthermore, the light of a microscope helps to see microorganisms. They are used in different fields for different purposes. In biochemistry lab, mostly these are used for identification of osazone crystal formed by different types of carbohydrates etc. Some of their uses are tissue analysis, the examination of forensic evidence, studying the role of protein within the Cell,and the study of atomic structure.

EQUIPMENT: INCUBATOR

The incubator is an insulated enclosure in which temperature, humidity, and other environmental conditions can be regulated at levels optimal for growth, hatching, or reproduction. A laboratory incubator is a

heated, insulated box used to grow and maintain microbiological or cell cultures. The incubator maintains optimal temperature, humidity and gaseous content of the atmosphere inside. Many **lab incubators** include a programmable timer that may cycle through different temperatures and humidity levels. Lab incubators vary in size from table-top units to large systems the size of a cupboard.

EQUIPMENT: SPECTROPHOTOMETER

A spectrophotometer is an instrument that measures the amount of photons (the intensity of light) absorbed after it passes through sample solution. With the spectrophotometer, the amount of a known chemical substance (concentrations) can also be determined by measuring the intensity of light detected.

Spectrophotometer Uses and Applications

- Quantifying concentrations of compounds.
- Determining the structure of a compound.
- Finding functional groups in chemicals.
- Determining the molecular weight of compounds.
- Determining the composition of materials.

EQUIPMENT: CENTRIFUGE MACHINE

Centrifuges separate or concentrate substances suspended in a liquid medium by density. Space-saving fixed- and variable-speed benchtop or tabletop centrifuges are used for applications including tissue culture, protein work, DNA/RNA research, and cell harvesting.

Parts of Centrifuge

- Motor: Electric motor is a part of the centrifuge which helps to drive.
- Control Panel: The control panel placed on the front casing serves the purpose of controlling centrifuge operation.
- Chamber: The entire system is housed within a chamber.

The extraction of fat from milk in order to produce skimmed milk.The removal of water from moist lettuce with the help of a salad spinner.The Spin-drying of water in washing machines in order to remove water from the clothing.The separation of solid blood and urine materials into forensic and testing laboratories.

EQUIPMENT: BOILING WATER BATH

Boiling is the rapid phase transition from liquid to gas or vapor; the reverse of boiling is condensation. Boiling occurs when a liquid is heated to its boiling point, so that the vapour pressure of the liquid is equal to the pressure exerted on the liquid by the surrounding atmosphere. Boiling and evaporation are the two main forms of liquid vapourization. In science, boiling happens when liquid becomes gas, forming bubbles inside the liquid

volume. In cooking, water is the most frequently used liquid that is boiled. The temperature when water will begin to boil is around 212 degrees Fahrenheit/100 degrees Celsius. This is called the boiling point.

A laboratory water bath is used to heat samples in the lab. Some applications include maintaining cell lines or heating flammable chemicals that might combust if exposed to open flame. A water bath generally consists of a heating unit, a stainless steel chamber that holds the water and samples, and a control interface.

EQUIPMENT: DIGITAL BALANCE

Digital Balances are devices used to precisely measure the mass of an object. Digital Balance For Laboratory digital mass balances in the General Chemistry labs are very sensitive instruments used for weighing substances to the milligram (0.001 g) level. Please treat them with care. Use containers when weighing chemicals and always weigh objects at room temperature.Chemical balance is a beam balance instrument that is used in a quantitative measure of the chemical with great precision. It measures the mass of the chemical up to four decimal places. It is used in the quantitative analysis of the chemical. It has the ability to recognise any minimal deviation.

EQUIPMENT: GLUCOMETER

Glucose meter or glucometer measures how much sugar is in the blood sample. The drop of blood you get with a finger prick is often enough to use on a test strip. A finger prick can be done with a special needle (lancet) or with a spring-loaded device that quickly pricks the fingertip.

EQUIPMENT: PH Meter

The PH meter is an electric device used to measure hydrogen-ion activity (acidity or alkalinity) in solution.A pH meter is an instrument used to measure. Hydrogen activity in solutions - in other words, this Instrument measures acidity/alkalinity of a solution. The degree of hydrogen ion activity is ultimately expressed as pH level, which generally ranges from 1to14.

APPARATUS: GLASS FUNNEL

Laboratory funnels are used to channel liquids or fine-grained chemicals (powders) into lab ware with a narrow neck or opening. Often, they are made of plastic such as polypropylene. Funnels and filtration products are familiar items in the laboratory used for filtering, filling, decanting or transferring liquids or powders from one vessel to another. Laboratory funnels are made from glass, plastic (typically HDPE) or occasionally metal.

APPARATUS : BEAKER

A wide glass with a lip for pouring that is used especially in chemistry for holding and measuring liquids. Measuring Beaker are tools used to measure the volume of liquids. Beakers are also used for stirring, mixing and heating liquids found in laboratory settings. Beakers are graduated. The liquid can be poured directly into the beaker and measured with the help of markings on the beaker.

APPARATUS: GRADUATED CYLINDER

A tall narrow container with a volume scale used especially for measuring liquids. Graduated cylinders are used for measuring volumes of liquid. Scientists will pour the liquid into the graduated cylinder and view it at eye level, lining up the bottom of the meniscus of the liquid with the measurement lines on the side of the cylinder.

APPARATUS : TITRATION FLAS

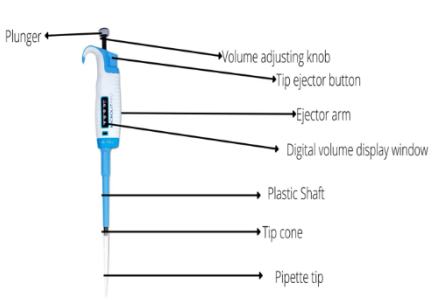
A titration flask is a type of laboratory flask which features a flat bottom, a conical body, and a cylindrical neck. It is most often used in a laboratory. Flasks can be used for making solutions or for holding, containing, collecting, or sometimes volumetrically measuring chemicals, samples, solutions, etc. for chemical reactions or other processes such as mixing, heating, cooling, dissolving, precipitation, boiling (as in distillation), or analysis.

APPARATUS : VOLUMETRIC FLASK

A glass flask used in a laboratory for holding chemical liquids and solutions. They are similar in shape to a Florence flask, but with a longer neck and wider flat bottom. Flasks can be used for making solutions or for holding, containing, collecting, or sometimes volumetrically measuring chemicals, samples, solutions, etc. for chemical reactions or other processes such as mixing, heating, cooling, dissolving, precipitation, boiling (as in distillation), or analysis.

APPARATUS 6: MICROPIPETTE

A micropipette is a common laboratory instrument used to measure small amounts of liquids with a volume range between 1 and 1000µl. A micropipette is also used to transfer a precise amount of fluid from one container to another.



Parts of a Micropipette

Curriculum of Undergraduate Students

1st Year MBBS

1. Foundation Module (6 Weeks)

S.No	Topic	Learning outcomes	Teaching Hours	Teaching Strategy	Assessment Tool
1.	**The Microscope**	Identify parts of microscope. Demonstrate operation of microscope. Describe the method of focusing slide at different magnifications. Follow the specified norms of lab work.	1.5 hour	Practical Demonstration Performance	OSPE Viva Practical notebook
2.	**Lab Equipment**	Introduction to lab techniques Identify the equipment used in lab work	1.5 hour	Practical Demonstration Performance	OSPE Viva Practical notebook
3.	**PH and buffer solutions**	Define normal solution Define standard solution. Prepare 0.1N solution of NaOH. Prepare 0.1N solution of HCL. Measure the PH of given	1.5 hour	Practical Demonstration Performance	OSPE Viva Practical notebook

		solution (practical).			

THEME–III: GROWTH & DEVELOPMENT OF HUMAN BODY

S. No	Topic	Learning outcomes	Teaching hours	Teaching Strategy	Assessment Tool
1	**Detection of Monosaccharide's**	Define Monosaccharide's Discuss structure and types Perform the sequence of tests to identify the monosaccharides in a given solution.	1.5 hours 1.5 hours 1.5 hours 1.5 hours	Practical Demonstration Performance	OSPE Viva Practical notebook
2	**Detecting of Reducing and non-reducing Sugars**	Define reducing sugars, types. Discuss structure and types of reducing sugars Perform Benedicts test	1.5 hours 1.5 hours 1.5 hours	Practical Demonstration Performance	OSPE Viva Practical notebook
3	**Detection of Polysaccharides in a givenSolution**	Define Polysaccharides. Discuss structures and types of Polysaccharides Perform the sequence of tests to identify the polysaccharides in a given solution.	1.5 hours 1.5 hours	Practical Demonstration Performance	OSPE Viva Practical notebook

3. Musculoskeletal Module (8 Weeks)

THEME I: Orientation and shoulder pain

S.No	Topic	Learning outcomes	Teaching hours	Teaching Strategy	Assessment Tool
1	**Detection of Sulphur containing amino acids**	Define Sulphur containing amino acids. Lead Sulphate test.	1.5 hour 1.5 hour	Practical Demonstration Performance	OSPE Viva Practical notebook

THEME II: Weak grip and painful hand

S.No	Topic	Learning outcomes	Teaching hours	Teaching Strategy	Assessment Tool
1.	Detection of Cyclic amino acids	Define Cyclic amino acids. Describe their structure and type Learn and perform Xanthoproteic test	1.5 hours 1.5 hours	Practical Demonstration Performance	OSPE Viva Practical notebook

2nd Year MBBS

GIT and Hepatobiliary Module

Theme 8: Wasting (Protein metabolism)

S.No	Topic	Learning outcomes	Teaching hours	Teaching Strategy	Assessment Tool
1.	**Determination of plasma proteins**	Estimate the plasma proteins in a given blood sample	1.5 hour	Practical Demonstration Performance	OSPE Viva Practical notebook

2.	**Determination of free, total and combined acidity of the Gastric juice**	Estimate free, total and combined acidity of gastric juice	1.5 hour	Practical Demonstration Performance	OSPE Viva Practical notebook
3.	**Determination of serum Bilirubin**	Estimate serum Bilirubin in a given blood sample	1.5 hour	Practical Demonstration Performance	OSPE Viva Practical notebook
4.	**Determination of Titrable acidity of urine**	Estimate the Titrable acidity of urine	1.5 hour	Practical Demonstration Performance	OSPE Viva Practical notebook

3. RENAL MODULE

S.NO	Themes of Renal Module	Duration
1.	Flank pain/Loin pain	1 week
2.	Scanty urine/Urinary retention and Edema	1 week
3.	Urinary incontinence	1 Week

THEME I: Flank pain/Loin pain

S.No	Topic	Learning outcomes	Teaching hours	Teaching Strategy	Assessment Tool
1.	**Titrable acidity of Urine**	Find out PH of urine	1.5 hours	Practical Demonstration Performance	OSPE Viva Practical note book

Theme II: Edema and Urinary retention/ Scanty Urine

S.No	Topic	Learning outcomes	Teaching hours	Teaching Strategy	Assessment Tool
1	**Urine analysis**	Determine the normal/abnormal constituents in the urine -Urine sugar -Amino acids -Proteins -Hemoglobin -Uric acid -Urea -Creatinine and	1.5 hours	Practical Demonstration Performance	OSPE Viva Practical notebook

		chloride -Calcium and phosphate,-Ammonia - Ketone bodies -Benzidine test for blood in urine			

Theme III: Urinary incontinence

S.No	Topic	Learning outcomes	Teaching hours	Teaching Strategy	Assessment Tool
1	**Creatinine in urine**	Estimation of creatinine in 24 hour urine sample	1.5 hours	Practical Demonstration/ Performance	OSPE Viva Practical notebook

5. ENDOCRINE MODULE

S.No	Topic	Learning outcomes	Teaching hours	Teaching Strategy	Assessment Tool
1	**Urinary glucose**	Detect glucose in urine	1.5 hours	Practical Demonstration/ Performance	OSPE Viva Practical notebook
2.	**Blood glucose**	Detect glucose in blood	1.5 hours	Practical Demonstration/ Performance	OSPE Viva Practical notebook
3.	**Glucose tolerance test**	Perform and interpret Glucose tolerance test	1.5 hours	Practical Demonstration/ Performance	OSPE Viva Practical notebook

Assessment

Objective Structured Practical/Clinical Examination

1. OSPE/OSCE stations are used for formative as well as summative assessment.
2. Time allocated for each station is five minutes as per the Examination rules ofKhyber Medical University, Peshawar.
3. All students are rotated through the same stations.
4. Stations used are unobserved, observed, interactive, and rest stations.
5. On unobserved stations, models, lab reports, radiographs, flowcharts, case scenarios may be used to assess the cognitive domain.
6. On observed stations, examiners don't interact with candidates and just observethe performance of skills /procedures.
7. On the interactive station, the examiner asks questions related to the task within the allocated time.
8. On the rest station, students are not given any task. They just wait to move to the next station.

Standard Operating Procedures (SOPs):

The following guidelines for the smooth running of Skills and Practicals are presented and the users are expected to follow these.

- Students are strictly prohibited to write anything on the apparatus, tables, walls etc.
- After using equipment and apparatus in the laboratory, everything should be placed at its place.
- Doors should be firmly closed and locked while leaving the lab area, and lights should be turned off.
- Students are not to be left unattended by faculty or staff at any time.
- In case any faculty members or students get hurt, a first aid kit will always be on hand in the Biochemistry lab.
- No food and drinks will be allowed in practical lab.
- Unauthorized persons are not allowed in the labs at any time.

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